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LIGHT CONDUCTORS AND THEIR APPLICATIONS (NATIONAL SYMPOSIUM, JA--ETC)
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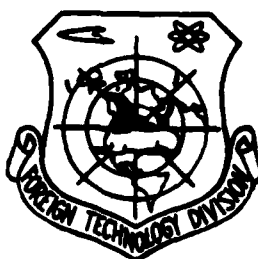


LIGHT CONDUCTORS AND THEIR APPLICATIONS
(NATIONAL SYMPOSIUM, JABLONNA 13-15 FEBRUARY 1979)

by

Boleslaw Grejcz

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LIGHT CONDUCTORS AND THEIR APPLICATIONS
(National Symposium, Jablonna 13-15 February 1979)

Boleslaw Grejcz, M.Eng.

The II National Symposium on light conductors and their applications took place on 13-15 February 1979 in Jablonna near Warsaw. This meeting was organized by the Committee on Electronics and Telecommunication of the Polish Academy of Sciences and the Institute of Communications, in collaboration with the Warsaw Polytechnic Institute, Union of the Industry of Subassemblies and Semiconductor Materials UNITRA-ELEKTRON, Association of Polish Electricians, the Military Academy of Technology, and the Polish Section of IEEE.

The sponsorship over the Symposium was assumed by the Minister of Communications, Prof. Dr. Edward Kowalczyk. Full member of the Polish Academy of Sciences Prof. Dr. Adam Smolinski acted as Chairman of the Symposium.

Altogether 140 persons participated in scientific sessions. They represented scientific, industrial and users organizations from the following countries: Finland, Holland, German Federal Republic, the United States of America, Switzerland, Great Britain, Italy and the Union of the Soviet Socialist Republics.

The meeting was opened by the Minister of Communications who spoke on the topic of the possibilities of applications and

directions of progress for light conductors. This speech appears in the present issue of "Wiadomosci Telekomunikacyjne". After the appearance of the Minister of Communications, inauguration greetings were extended by Prof. Dr. Janusz Groszkowski - Nestor of radiotechnical sciences - and by Prof. Dr. Alfred Swit - Chairman of the Committee for Electronics and Telecommunication of the Academy of Sciences.

An introductory paper entitled "Progress in the area of light conductor telecommunication" was presented by Prof. Dr. Adam Smolinski. In this paper the author covered achievements in the field of light conductors during the last three years, i.e., from the time of I Symposium on light conductors and their applications which took place in 1976 in Jablonna. The uses of optical conductors are various, but they may play the main role in telecommunication. The progress in light-conductor telecommunication has been made possible due to achievements in the area of electro-optical semiconductor devices and due to improved quality of the produced glass fibers. The author discussed three generations of the light-conductor telecommunication systems.

The first generation utilizes frequencies in the wave range about $0.85 \mu\text{m}$, and the second generation - in the wave range about $1.3 \mu\text{m}$. The second range is particularly interesting since the decay and dispersion of light conductors reach the smallest values at these wavelengths. This fact allows to use longer reinforcing sections and larger binary throughput in light-

-conductor cables. Unfortunately, no light sources appropriate for this range, such as electroluminescence diodes or semiconductor lasers, have yet been achieved. Better results have been achieved in the area of light receivers - which are semiconductor photodiodes.

The latest achievements in the technology of light conductors make it possible to transfer telecommunication signals for the distance of 50 km without the use of reinforcing or regenerating devices. However, the present state of art is based mainly on light conductors in sections up to 10 km.

The difficulties in cworking of semiconductor devices with light conductors may be overcome by application of integrated optoelectronics. The light-conductor telecommunication utilizing this technique is referred to as the third generation of light-conductor telecommunication systems.

Prof. Dr. Smolinski mentioned in his presentation that lately 350 years have passed from the time when the first glass works appeared on the American continent, and these works were built by immigrants from Poland.

After the introductory presentation, the following papers were read by the foreign guests:

- Prof. M.E. Zabolynski from the Institute of Radiotechnology and Electronics of the Academy of Sciences USSR - Physical aspects of the technology of glass fibers.

- J.A. Olszewski from General Cable Corporation (USA) - Present directions of the development of optical cables.
- Dr. H. Block from Hoogbouw Electrotechniek Mekelweg (Holland) - Directions of progress in optical telecommunication systems.
- Dr. J.E. Midwinter from Post Office Research Centre (Great Britain) - Studies in Great Britain on optical systems from glass fibers.
- Dr. Leonardo Michetti from CSELT (Italy) - The present state and the perspectives of development of the optical telecommunication in Italy.
- Dr. A.B. Sharma from the Helsinki Technological University (Finland) - Studies of optical fibers in the Laboratory of the Helsinki Technological University.
- Dr. A. Regreny and A. Gouronnec from Centre National d'Etudes des Telecommunications (France) - Technology of the drawing of fibers.
- Dr. D.N. Payne from the University of Southampton (Great Britain) - Project of light conductors intended for a range at the wavelength $1.3 \mu\text{m}$.
- Prof. F.P. Checcacci. Prof. A.M. Scheggi from IROE-CNR (Italy) - Technology and characteristics of fibers from silica covered with silicon.
- Dr. M. Lappihalmu from the Helsinki Technological University (Finland) - Characteristics of fibers and planar wave conductors.

- Prof. B. Daino from Fondazione Ugo Bordoni (Italy) - Characteristics of the problems of optical fibers and measuring techniques.
- Dr. J. Feldman from Forschungsinstitut der Deutschen Bundespost (German Federal Republic) - The first installation experiments and studies of optical telecommunication lines in telephone channels.
- Dr. M. Papuchon from Laboratoire Central de Recherches Thomson (France) - Instruments of integrated optics and their uses.
- Dr. A.L. Harner from Battele Research Center (Switzerland) - Results on mechanical strength when drawing fibers in graphite furnaces.

Further proceedings took place in specialized sections where papers and reports were presented by Polish specialists from various scientific-technological institutions.

In the topical group "Sources and detectors of radiation", under chairmanship of Doc. B. Mroziewicz, the papers presented were as follows:

- Dr. B. Darek, T. Lipinski, A.M. Kontkiewicz - Electroluminescent diode from gallium arsenide of Burrus construction.
- T. Bryskiewicz, J. Dmochowski, K. Franc, K. Kopalko, K. Mazurek - Preliminary results concerning the joined lasers of "buried" type.
- S. Banasiak, M. Pilch, M. Burański, L. Szymanski - Bihetero-junction laser from GaAlAs.

- M. Osinski - Application of the model of Epstein layer in the theory of transverse modes in joined strip lasers.
- M. Wegrzecki - Epiplanar photodiode optimized for light-conductor telecommunication.
- I. Wegrzecka - Basic properties of a silicon cascade photodiode developed at ITE CEMI.
- M. Brzeska - Selected results of investigations on PIN photodiodes.

The second topical group "Light conductors" working under the chairmanship of Prof. A. Waksmundzki had the following papers:

- L. Kociszewski - Possibilities of the production of optical fibers by the method of double crucible.
- J. Kucharski, J. Dorosz, M. Bozyk, W. Jarmoc - Two-layer optical fibers.
- A. Gorgol, M. Kloza, R. Parosa, E. Reszke - Utilization of plasma in the process of production of light conductors.
- J. Wojcik, A. Gorgol, W. Demidziuk, M. Parol, A. Tadeusiak - Preparation of quartz optical fibers for telecommunication.
- R. Romaniuk - Methods of investigation of the dispersion of multimode light conductors.
- P. Jachura, M. Szustakowski - Optimization of the distribution of the coefficient of refraction because of the minimum dispersion in a cylindrical light conductor.

- R. Romaniuk - Interpretation of geometrical arguments of the wave functions for a light conductor with an alpha distribution of the coefficient of light refraction.

Another topical group "Telecommunication installations and systems", chaired by Prof. W. Majewski and Doc. A. Zielinski, considered the following papers:

- Z. Szpigler - The first experimental light-conductor telecommunication cable line in Poland.
- M. Zawadzki - Experimental light-conductor line with throughput 1544 Mbit/sec. Transmitting installations.
- R. Car - Experimental light-conductor line with throughput 1.544 Mbit/sec. Receiving installations.
- M. Parol, A. Gorgol - Preparation of experimental light-conductor cables.
- S. Zbyrad - Construction of an experimental light-conductor line.
- K. Adamski, T. Reczynski, J. Markowski, R. Romaniuk - Elements of light-conductor junction with throughput 8448 kbit/sec.
- M. Rydel - Transmission codes in light-conductor systems.
- M. Rzewuski - Generator of current impulses for semiconductor laser.
- M. Jasiewicz - Instrument for cutting of light conductors.

In the topical group "Measurements of light conductors", under the leadership of Doc. M. Pluta and Doc. L. Kociszewski, the discussed papers were as follows:

- W. Demidziuk - Measurement of profile of the coefficient of refraction in the core of a light conductor.
- J. Helsztynski, W. Jasiewicz - Measurement of profile of the coefficient of refraction.
- J. Helsztynski, M. Rzewuski, A. Majewski, W. Jasiewicz, K. Jedrzejewski - A system for measuring the fading (decay) of light conductors.
- J. Helsztynski - Measurement of fading of optical conductors as a function of wavelength.
- M. Pluta - Measurements of profile of the coefficient of refraction of light conductors.
- T. Kozek - Methods of measurement of the parameters of planar light conductors.
- A. Kowalski, I. Grodzka - Experimental light conductor line with throughput 1.544 Mbit/sec. Measurements of static parameters of quartz light conductors.
- A. Czerwotka, M. Pluta - Application of a planar light conductor for evaluation of microunevenness of supersmooth polished surface of optical glass.

The following papers were presented in the topical group "Elements of integrated optics", chaired by Doc. H. Kalita and Doc. J. Petrykiewicz:

- Cz. Zajac, J. Kruszewski - Planar dielectric light conductor prepared by diffusion method.
- T. Maciak, K. Jedlinski, J. Kruszeski - Light conducting organic layers.
- A. Czerwonka, W. Chabros, G. Kopec, M. Pluta - A thin layer of SiO_x as a planar light conductor.
- J. Jannson - Capabilities of a distributor of planar optical systems.
- J. Jannson - The analysis of coupling: prism - anisotropic light conductor.
- K. Gniadek - The effect of fluctuation of the direction of optical axis in an anisotropic light conductor upon the spatial field structure and losses of transmitted power.
- W. Wolinski, M. Siniarski, R. Wolski - Preparation of a planar light conductor in LiNbO_3 by the method of diffusing out Li_2O .

The last topical group "Other applications of light conductors", led by Doc. M. Kloza and Doc. J. Kucharski, discussed the following papers:

- S. Masternak, M. Szustakowski - Light conducting delaying lines in the treatment of optical and microwave signals.

- A. Pawlaczyk, I. Zawadzki - Application of light conductors from glass fibers in steering (control) circuits of rail vehicles.
- F. Szczot - Light conductors in ignition systems of thyristors connected in series.
- I. Rutkowska - Application of light conductors in optometric instruments.
- I. Rutkowska - Volleyball Net as a Combined Bunch of light Conductors.
- O. Tchorz, T. Trynieszewski, T. Zlotkowski - Bundles (packets) of light conductors for decorative lamps.
- W. Chalupka, M. Giertych - Possibilities of the utilization of light conductors in studies of the physiology of development of buds in woody plants.

During this Symposium a film on the topic of light conductors was projected and seen by participants; this movie film was made by the Galileo company (USA).

It is anticipated that the III National Symposium "Light conductors and their applications" will take place in 1982.

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